

PETITION

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Your Petitioners, John Price and Leighton Schafer, citizens of the United States of America and residents of the State of Nebraska, whose residence and mailing address for John Price is 2162 East Lake Drive, Union, Nebraska 68455, and for Leighton Schafer is 310 First Street, Dubois, Nebraska 68345, pray that Letters Patent Protection be granted to them for an

IMPROVED METAL SHEET PUNCH DEVICE

as set forth in the following specification:

Background of the Invention

1. Technical Field

The present invention relates to punch devices and, more particularly, to a metal sheet punch device having a longitudinally extended frame having forward and rearward ends, an alignment device mounted on the frame for aligning the frame on a metal roof, at least two metal punch devices mounted on the frame, each device including a metal punch support arm structure movably mounted on the frame, a generally pointed metal punch mounted on the underside of the metal punch support arm structure, and a support arm structure drive device mounted on the frame which is operatively connected to the metal punch support arm structure to move the metal punch support arm structure between a retracted position and an extended position, and a trigger device operatively connected to each of the metal punch devices to trigger the metal punch devices to punch securement screw indentations in the metal roof.

2. Description of the Prior Art

Metal sheeting for roofs, ceilings and walls are used on many different types of buildings, including both commercial and residential structures. Of these, the metal roof is the most common use of metal sheeting, and the standard metal roof would include a wooden or metal roof frame consisting of a plurality of spaced beams, usually referred to as "nailers" or "purling", extending between and connecting the upper sections of the walls of the building. Mounted on this framework are a plurality of metal roof sections, which generally have widths of between three and four feet (3' to 4' with the usual width being approximately 38") and have lengths of six feet up to forty feet (6' to 40') depending on the intended use of the sheet. The metal sheet sections also are usually "corrugated" to include alternating raised and lowered sections of the roof section for increased structural stability. Once the metal roof section is placed on the underlying roof framework, the metal roof section is affixed to the roof framework by a plurality of screws or other such fasteners which extend downwards through the metal roof section into the framework underneath the metal roof section. The next section of the metal roof is then partially overlapped with the metal roof section affixed to the roof frame, and the process is continued until the metal roof is erected.

While the preceding description of the erection of the metal roof sounds relatively simple, in practice the erection of a metal roof is anything but simple. In fact, two main problems occur with virtually every metal roof erection, the first being that once the metal roof section is placed on the roof frame, the position of

1 each beam must be estimated beneath the metal roof section to
2 permit proper connection of the metal roof section to the roof
3 frame. Second, the positioning and insertion of each of the
4 fastening screws through the metal roof section should be in an
5 alignment pattern which not only secures the metal roof section to
6 the roof frame, but also is aesthetically pleasing to enhance both
7 the functionality and appearance of the metal roof once it is
8 erected. There is therefore a need for a relatively simple and
9 efficient device which will properly align and space the screws
10 being used to secure the metal roof section to the roof frame.

11 In the prior art, alignment of the securement screw
12 indentations was generally performed by formation of a chalk line
13 on the metal roof section. Specifically, a roof installer would
14 extend a chalk line from one end of the metal roof section being
15 installed to the opposite end thereof with the chalk line aligned
16 above the metal roof section with the roof support beam positioned
17 underneath the metal roof section such that when the chalk line was
18 "snapped," the resulting chalk line would be aligned generally
19 parallel with the underlying roof beam. The roof installer would
20 then proceed along the chalk line marking at generally equal
21 distances the locations for the series of securement screw
22 indentations to be formed in the metal roof section. Once the
23 locations of the securement screw indentations were determined
24 along the chalk line, the roof installer would then proceed to form
25 the indentations with a metal punch and hammer, forming each of the
26 indentations one at a time along the chalk line, or alternatively
27 may even use only a self-tapping screw to pierce the metal sheet.
28 Finally, the roof installer would return to each of the securement

1 screw indentations and insert the securement screw into the
2 indentation to secure the metal roof section to the underlying roof
3 support beam. Although years of practice may increase the speed
4 with which the above-described method is performed, it is
5 abundantly clear that this procedure is time-consuming and fraught
6 with opportunities for error and therefore there is a need for an
7 improved system and device by which a plurality of securement screw
8 indentations may be formed in the metal roof section in an accurate
9 and efficient manner.

10 There are some devices found in the prior art which, when used
11 in connection with some types of formed sheet metal such as gutters
12 and the like, will form a punch hole in the metal. These single-
13 punch devices have been in existence and have been used with metal
14 gutters, but the modifications necessary to permit use of these
15 devices with metal sheets often would render the devices inoperable
16 for their original intended purpose. Furthermore, although these
17 devices, if modified, could conceivably provide alignment for a
18 single screw to be placed through a metal roof section into the
19 underlying frame, they still will not solve the problem of the
20 alignment of multiple screws and the spacing thereof to enhance the
21 functionality and appearance of the series of screws. There is
22 therefore a need for a multiple punch device which will not only
23 provide alignment of the screw holes with the underlying roof
24 frame, but will also space the screws in their preferred securement
25 spacing to ensure both improved functionality and improved
26 aesthetic appearance.

27 There is therefore a need for an improved metal sheet punch
28 device.

1 Another object of the present invention is to provide a metal
2 sheet punch device which includes a longitudinally extended frame
3 having alignment devices mounted thereon to properly align the
4 metal frame on the metal roof and at least two metal punch devices
5 mounted on the frame for forming at least two indentations in the
6 metal roof into which fastening screws may be quickly and easily
7 inserted.

8 Another object of the present invention is to provide a metal
9 sheet punch device in which the metal punch devices include a metal
10 punch support arm structure movably mounted on the frame, a
11 generally pointed metal punch having a pointed lower end mounted on
12 the underside of the metal punch support arm structure, and a
13 support arm structure drive device such as a spring or pneumatic
14 jack which is operatively connected to the metal punch support arm
15 structure to move the metal punch support arm structure between a
16 retracted position and an extended position to drive the metal
17 punch into the metal roof section.

18 Another object of the present invention is to provide a metal
19 sheet punch device which will quickly and easily form multiple
20 securement screw indentations in a metal roof section, the
21 indentations being properly spaced from one another and generally
22 accurately aligned with the underlying roof beam to which the metal
23 roof section is to be affixed.

24 Another object of the present invention is to provide a metal
25 sheet punch device which can be quickly and easily used to form the
26 securement screw indentations, yet which does not necessarily
27 require connection to an external power source, thus preventing
28 wire entanglements and the necessity for hose connections required

1 by other devices found in the prior art.

2 Finally, an object of the present invention is to provide a
3 metal sheet punch device which is relatively simple and economical
4 in construction and is safe, efficient, and accurate in use.

1 **Summary of the Invention**

2 The present invention provides a metal sheet punch device for
3 metal roofs which includes a longitudinally extended frame having
4 forward and rearward ends and alignment devices mounted on the
5 frame adjacent the forward and rearward ends for aligning the frame
6 on a metal roof. At least two metal punch devices are mounted on
7 the frame, each of the metal punch devices including a metal punch
8 support arm structure movably mounted on the frame, the metal punch
9 support arm structure movable between a retracted position and an
10 extended position relative to the frame, and a generally pointed
11 metal punch having a pointed lower end, the generally conical metal
12 punch mounted on the underside of the metal punch support arm
13 structure. A support arm structure drive device such as a coiled
14 spring or pneumatic jack is mounted on the frame and operatively
15 connected to the metal punch support arm structure to rapidly move
16 the metal punch support arm structure between the retracted
17 position and the extended position. Finally, a trigger device is
18 operatively connected to the metal punch devices, the trigger
19 device operative to trigger each of the support arm structure drive
20 devices operatively connected to each of the metal punch devices to
21 drive the metal punch support arm structures from the retracted
22 position to the extended position such that the metal punches
23 engage the metal roof positioned there underneath to generally
24 simultaneously form at least two spaced-apart indentations in the
25 metal roof by impact of the metal punches with the metal roof, the
26 indentations then being used for the insertion and alignment of
27 securement screws to secure the metal roof section on the
28 underlying roof support frame.

1 The metal sheet punch device as thus described is far superior
2 to those devices found in the prior art. Specifically, the ability
3 of the present device to perform simultaneous multiple punches
4 which are accurately aligned with the underlying roof frame greatly
5 decreases the amount of time needed to align and lay out the
6 punched indentations required when using the methods of the prior
7 art, such as chalk lining or the like. Furthermore, because the
8 present invention, when outfitted with coiled springs, is
9 independent of any power source, it is much easier and safer for a
10 roof installer to use than many other electrical or pneumatic
11 devices used in construction. Also, because of the forward and
12 rearward alignment devices mounted on the longitudinally extended
13 frame, it is difficult for a user of the present invention to
14 incorrectly use and align the invention, thus greatly reducing the
15 opportunity for mistakes and increasing the efficiency with which
16 the metal roof is assembled. Finally, because the metal sheet
17 punch device of the present invention is generally intuitive in
18 use, it does not take a great deal of training to learn to use the
19 present invention, meaning that virtually any worker from the most
20 skilled to the least skilled may use the present invention to
21 properly and quickly produce securement screw indentations in the
22 metal roof sections. It is thus seen that the present invention
23 provides a substantial improvement over those roof punch devices
24 found in the prior art.

1 **Brief Description of the Drawings**

2 Figure 1 is a perspective view of the metal sheet punch device
3 of the present invention being used on a metal roof;

4 Figure 2 is a perspective view of the metal sheet punch device
5 of the present invention;

6 Figure 3 is a detailed side elevational view of the present
7 invention during the "cocking" phase of use;

8 Figure 4 is a detailed side elevational view of the present
9 invention immediately prior to triggering of the metal punches;

10 Figure 5 is a detailed exploded perspective view of one metal
11 punch device found in the present invention;

12 Figure 6 is a detailed side elevational view of one metal
13 punch device of the present invention showing the operation of the
14 punch device;

15 Figure 7 is a detailed side elevational view of one metal
16 punch device of the present invention showing the metal punch
17 forming an indentation in the metal roof section; and

18 Figure 8 is a detailed side elevational view of the rearward
19 end of the longitudinally extended frame showing the trigger bar
20 being raised to trigger the operation of the metal punch devices.

Description of the Preferred Embodiment

The metal sheet punch device **10** of the present invention is shown best in Figures **1-4** as including a longitudinally extended frame **12** having a forward end **14** and rearward end **16** and a plurality of metal punch devices **50a**, **50b**, **50c**, and **50d** which are movably mounted on the frame **12**. In the preferred embodiment, the longitudinally extended frame **12** is constructed as including a pair of generally parallel frame plates **18a** and **18b** which are constructed of a durable material such as metal, aluminum or hardened plastic and would have a length of approximately 36 to 60 inches, a vertical height of approximately 1 to 6 inches, and would be spaced from one another approximately 1 to 6 inches, the frame plates **18a** and **18b** being supported apart from and connected to one another by a plurality of spacer rods **20**. It is further preferred that each of the elements of the present invention be constructed of rigid and durable materials, and therefore it is expected that the metal sheet punch device **10** will be constructed of metal such as steel or aluminum or a hardened plastic material, depending on the intended functionality of the element being constructed.

Mounted on and extending forwards from forward end **14** of frame **12** is forward alignment device **22** which, in the preferred embodiment, would include a pair of mounting arms **24a** and **24b** extending forwards from the frame **12** and an alignment plate mounting bar **26** which extends between and connects the forward ends of mounting arms **24a** and **24b**, as shown best in Figure **2**. Mounted on and extending forwards from alignment plate mounting bar **26** is the alignment plate **28** which, in the preferred embodiment, would be a generally rectangular or trapezoidal plate extending generally

1 horizontally from the alignment plate mounting board **28** and would
2 further include a generally U-shaped screw engagement slot **30**
3 formed in the forward end of alignment plate **28** and extending
4 rearwards towards frame **12** as shown best in Figure **2**. The screw
5 engagement slot **30** is designed to fit over and engage a securement
6 screw **92** which has already been mounted on the metal roof section
7 **90** as shown best in Figure **1**. As this securement screw **92** is
8 already accurately aligned on the metal roof section **90** extending
9 into the underlying roof frame beam **94**, engagement of the
10 securement screw **92** by the screw engagement slot **30** results in a
11 precise proper alignment of the forward end **14** of longitudinally
12 extended frame **12** on the metal roof section **90**.

13 Mounted on rearward end **16** of longitudinally extended frame **12**
14 is a rearward alignment structure **32** which, in the preferred
15 embodiment, includes a pair of downwardly depending rear alignment
16 bars **34a** and **34b** mounted on the outside of each of the frame plates
17 **18a** and **18b** and extending downward below the base of the frame
18 plates **18a** and **18b** approximately one to four inches. Due to the
19 overall length of longitudinal frame **12**, when the metal sheet punch
20 device **10** is placed on the metal roof section **90** with the screw
21 engagement slot **30** engaging securement screw **92**, the rear alignment
22 bars **34a** and **34b** are positioned outside of the edge of metal roof
23 section **90** to depend downwards over the roof frame beam **94** on which
24 the metal roof section **90** is to be mounted. Each of the rear
25 alignment bars **34a** and **34b** are positioned on the opposite side of
26 the roof frame beam **94** thus ensuring that the metal sheet punch
27 device **10** is properly aligned on the metal roof section **90** such
28 that the securement screw indentations formed by the metal sheet

1 punch device **10** are aligned with the roof frame beam **94** on which
2 the metal roof section **90** is positioned. The positioning of the
3 metal sheet punch device **10** is thus correctly performed by merely
4 aligning the forward alignment structure **22** with the securement
5 screw **92** and the rearward alignment structure **32** with the roof
6 frame beam **94**, an operation which can be performed quickly and
7 easily with a maximum degree of accuracy each and every time the
8 metal sheet punch device **10** of the present invention is used.

9 The metal sheet punch device **10** of the present invention also
10 may include forward and rearward frame support legs **36a**, **36b**, **38a**
11 and **38b** mounted on and extending downwards from frame **12** which
12 assist with the positioning and support of the frame **12** when placed
13 on the metal roof section **90**. The metal sheet punch device **10** of
14 the present invention also may include a forward handle **40** and a
15 carrying strap (not shown) to facilitate the lifting and placing of
16 the metal sheet punch device **10** on the metal roof section **90**.

17 While the positioning of the metal sheet punch device **10** of
18 the present invention in the proper orientation is important, it
19 would be of little effect if the formation of the securement screw
20 indentations still need to be performed by hand. Therefore, the
21 metal sheet punch device **10** of the present invention includes a
22 plurality of metal punch devices **50a-d** each of which are designed
23 to mechanically create a securement screw indentation in the same
24 manner each and every time to ensure accurate spacing and accurate
25 placement of the securement screw indentations. As each of the
26 metal punch devices **50a-d** are generally identical to one another
27 and are triggered in substantially the same manner, the following
28 description of metal punch device **50a** should be understood to apply

1 equally to metal punch devices **50b**, **50c** and **50d**.

2 Metal punch device **50a** is shown best in Figures **5**, **6** and **7** as
3 including a metal punch support arm structure **52** which includes
4 left and right punch support bars **54a** and **54b**, actuating arm **56**
5 mounted on and extending forwards from punch support bars **54a** and
6 **54b** and the metal punch **58** itself which is mounted on the punch
7 support bars **54a** and **54b** and extends downwards therefrom. The
8 punch support bars **54a** and **54b**, actuating arm **56** and metal punch **58**
9 are secured to one another by a plurality of bolts **60** and the
10 assembled metal punch support arm structure **52** is pivotally mounted
11 on the longitudinally extended frame **12** via pivot bolt **62** which
12 extends through the rearward ends of punch support bars **54a** and **54b**
13 and through the frame plates **18a** and **18b**.

14 Mounted on and extending between the frame plates **18a** and **18b**
15 rearward of the metal punch support arm structure **52** is a spring
16 anchor **64** which would preferably consist of a plate **66** having a
17 bolt **68** extending therethrough to secure the back end of the coiled
18 spring **70** such that when metal punch support arm structure **52** is
19 pivoted about pivot bolt **62**, the tension in coiled spring **70**
20 attempts to drive the metal punch support arm structure **52**
21 downwards, or as is shown in Figure **7**, rotate the metal punch
22 support arm structure **52** in a counterclockwise direction about
23 pivot bolt **62** thus driving metal punch **58** downwards to contact the
24 metal roof section **90** over which the metal sheet punch device **10** is
25 positioned. Of course, it should be noted that the coiled spring
26 **70** may be replaced by any appropriate drive device, such as a
27 pneumatic or hydraulic piston or ram which would be connected to
28 the metal punch support arm structure **52** in the appropriate manner

1 to drive the metal punch support arm structure **52** downwards to
2 drive metal punch **58** into the metal roof section **90** to create the
3 securement screw indentation **96** shown best in Figure **7**. Such
4 substitution of alternate drive devices would be understood by
5 those skilled in the art of pneumatic and hydraulic systems.

6 The trigger mechanism for the metal punch support arm
7 structure **52** is shown best in Figures **5**, **6** and **7** as including a
8 pair of downwardly and forwardly depending trigger bars **74a** and **74b**
9 between which extends an actuating arm engagement bolt **76** which
10 extends through the generally L-shaped slot **57** in actuating arm **56**
11 as shown best in Figures **6** and **7**. The upper ends of trigger bars
12 **74a** and **74b** are connected to trigger actuating arm **78** which extends
13 along the length of frame plates **18a** and **18b** as shown best in
14 Figure **6**. The trigger actuating arm **78** is slidably mounted between
15 frame plates **18a** and **18b** such that the trigger actuating arm **78** may
16 be slid in a generally horizontal plane. The sliding or "cocking"
17 of the trigger actuating arm **78** is performed by the rotation of
18 trigger bar **80** which is rotatably mounted on the frame **12** as shown
19 best in Figures **3** and **4**. The metal punch device **50a** would thus be
20 triggered in the following manner.

21 As trigger bar **80** is rotated upwards, trigger actuating arm **78**
22 is slid rearwards towards the rearward end **16** of longitudinally
23 extended frame **12** thus producing the movement shown best in Figures
24 **6** and **8** of the drawings. The movement of the trigger actuating arm
25 **78** moves trigger bars **74a** and **74b** rearwards permitting actuating
26 arm bolt **76** housed within L-shaped slot **57** of actuating arm **56** to
27 slide rearwards and fall into the lower section of the L-shaped
28 slot **57** as shown in Figure **6**. As trigger bar **80** is returned to its

1 position adjacent the frame 12, trigger actuating arm 78 is slid
2 forwards and, as best shown in Figure 7, the trigger bars 74a and
3 74b are slid forward also with actuating arm bolt 76 being
4 temporarily caught within the lowermost portion of L-shaped slot 57
5 of actuating arm 56. This causes the metal punch support arm
6 structure 52 to be pulled upwards and forwards in clockwise
7 rotation about pivot bolt 62 (from the viewpoint of Figure 7) thus
8 tensioning coiled spring 70. As the sliding of trigger actuating
9 arm 78 continues, the actuating arm bolt 76 eventually reaches a
10 point within L-shaped slot 57 of actuating arm 56 where it no
11 longer is frictionally retained within the lowermost portion of L-
12 shaped slot 57 and the actuating bolt 76 slides forwards within L-
13 shaped slot 57 releasing actuating arm 56 and thus metal punch
14 support arm structure 52. The tension built up in coiled spring 70
15 thus is released driving the metal punch 58 downwards to impact the
16 metal roof section 90 to create the securement screw indentation 96
17 as shown best in Figure 7. As each of the metal punch devices 50a-
18 d are generally identical and are generally identically connected
19 to the trigger actuating arm 78 and trigger bar 80, each of the
20 metal punch devices 50a-d are generally simultaneously triggered to
21 create four identical securement screw indentations 96 which are
22 spaced along the metal roof section 90 in the predetermined
23 indentation locations. The metal sheet punch device 10 may then be
24 moved to the next location, aligned and triggered to create the
25 next set of securement screw indentations in the metal roof section
26 90. It is thus seen how quickly and easily a number of
27 indentations is formed in the metal roof by use of the present
28 invention, thus greatly increasing the efficiency of the user of

1 the present invention and reducing mistakes and risks associated
2 with those devices and systems found in the prior art for
3 performing the indentation forming task.

4 For facilitating carrying of the metal sheet punch device **10**
5 of the present invention, a carrying strap **82** may be attached to
6 one or more of the spacer rods **20** as shown in Figures **1** and **2**. The
7 carrying strap **82** is preferably constructed of nylon or another
8 such durable material and is used in conjunction with the trigger
9 bar **80** to lift and carry the metal sheet punch device **10** between
10 use locations.

11 It is to be understood that numerous modifications, additions
12 and substitutions may be made to the present invention which fall
13 within the intended broad scope of the appended claims. For
14 example, the size, shape and construction materials used in
15 connection with the metal sheet punch device **10** of the present
16 invention may be modified or changed so long as the intended
17 functionality of the invention is maintained. Likewise, the
18 precise nature of the support arm structure drive device may be
19 modified or changed to incorporate not only a coiled spring but
20 other types of drive devices such as pneumatic or hydraulic
21 pistons, any of which would be understood by those skilled in the
22 art of such systems. Furthermore, the precise nature of the
23 triggering device and precise arrangement of the metal punch
24 devices may be modified or changed so long as the intended
25 functional features of creating a plurality of securement screw
26 indentations in a metal roof section in a general simultaneous
27 manner is preformed. Finally, although the present invention has
28 been described for use in connection with corrugated metal roofs,

1 it may be adapted for use in virtually any situation where a
2 plurality of spaced indentations are to be formed to permit the
3 insertion of fastening devices therein.

4 There has therefore been shown and described a metal sheet
5 punch device **10** which accomplishes at least all of its intended
6 objectives.